

Work Order ID 84098

84098

Page 1

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Aft

Start Date: 02/05/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: HLJ

Date: 12/05/02

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start ***NR1***

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr

Revision Nbr

D412-664-243

E/DEO

100

0.00

100

DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile and create labels as per PPP D412-664-203 CHG 008

JB 5/2/06 OK for ch 12/7/06

110

0.00

110

Packaging

Packaging

Memo

0.00

Packaging

JW 12-6-20

120

0.00

120

BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D412-664-243 using CNC bender program 412-aft and Folio FT010

Ran/mo 12-6-25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes ☒ No ☐ DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
12/6/25	120	Crushing from bending is over tolerance at bottom of bend	JP 12/6/25	Acceptable per attached SR		JP 12-06-25	JP 12/6/25	JP 12-06-25

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 2

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***

Start Date: 02/05/2012 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***
Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

130 QC15- Crosstube Dimensional Check 0.00

130

QC Memo 0.00

Quality Control

12-06-25

140 0.00

140

Crosstubes Memo 0.00

Crosstubes

Crosstubes

Memo
1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551 and drill table DT8577 using #9 holes as per QSI 10 to install towers.

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-SCRIBE PART # & BATCH #

4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

MO 12-6-25

Rm 12-6-26

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***

Start Date: 02/05/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150	Crosstubes Chemical Conversion	0.00							
150									
HandFXtube	Memo	0.00							
Hand Finishing Crosstubes									
160	QC3- Inspect Part Finish	0.00							
160									
QC	Memo	0.00							
Quality Control									
170	QC5- Inspect part completeness to step on W/O	0.00							
170									
QC	Memo	0.00							
Quality Control									

n/a

Subsets

710

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
		Move Sfor #150 + #160 to after Sdp #200					S 12/09/26

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 4

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Aft

Stop

NS2

Start Date: 02/05/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

180

Outsource process - NDT per QSI038 4.1

0.00

180

Outsource2

Memo

0.00

Outsource process - NDT

Liquid Penetrant Inspection as per QSI 038Or
Issue P/O: 17312 LPI as per ASTM 1417
Level 2 Attach copy of NDT results to work order

CZ 12/06/27 ①

190

Packaging

0.00

190

Packaging

Memo

0.00

Packaging

Inspect for transit damage
Ensure copy of NDT results attached to work order.

12/6/27 ①

200

QC5- Inspect part completeness to step on W/O

0.00

200

QC

Memo

0.00

Quality Control

Inspect for damage & ensure results are as per Dwg D412-664-203

1 12/6-27

5/16/26

* chemical cont As per QSI2005

* QC7 inspect chemical cont

① 12-6-27
① 12-6-27

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 5

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Crosstube Aft

Start Date: 02/05/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start *NR1*

QC:

Date:

SPC (Y/N):

Date:

Stop *NR2*

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

210

0.00

210

SprayPaint

SprayPaint

Memo

0.00

Spray Painting

Mask underside of crosstube as shown

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per DEO D412-664-243 and QSI 005 4.2

PRIME: 121740

Start Time: 7:30

Finish Time: 8:30

PAINT: 120985

Start Time: 4:15

Finish Time: 5:00

AS 12-7-1

AS 12-7-1

Clear 121687

Flat 122142

start 8:00

Finish 8:45

AS 12-7-3 PTO->

220

QC14- Inspect Spray Paint

0.00

220

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

m/ 12 07 03 ①

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
12/07/04	210	AT STEP 210 INFORMATION REFERRING TO CLEAR COAT PROTECTION ACCORDING TO DEO NO D412-664-243-E-1 IS MISSING AND THE ADDITION OF POLYUREA 20% FLAT IN CLEAR COAT.	P. Smith QA	12/07/04	1		<i>[Signature]</i>

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 6

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***

Start Date: 02/05/2012 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
230		0.00							
230	Crosstubes					<u>AB</u>	<u>12</u>	<u>7</u>	<u>5</u>
Crosstubes	Memo	0.00							
Crosstubes	Assemble as per Dwg D412-664-203								
	1- Install chafing shield as per DEO D412-664-243. Top holes should be facing up.								
	A/R Proseal 890 Batch: <u>121287</u>								
	EXP: <u>11/12</u>								
	2- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe								
	3- Install support with Scotch-Weld DP460 and install clamps as per DEO Dwg D12-664-243 using installation jig DT9024. Torque clamps as per dwg								
	A/R Scotch-Weld DP460 Batch: <u>120398</u>								
	EXP: <u>14 May, 2013</u>								
240	QC5- Inspect part completeness to step on W/O	0.00							
240									
QC	Memo	0.00							
Quality Control									

Sinhalo

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 7

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Aft

Stop ***NS2***

Start Date: 02/05/2012 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
250	Pick Kit	0.00							
250									
Packaging	Memo	0.00				1			12/07/06 JB
Packaging									
260	QC4- 100% Inspect kits for completeness	0.00							
260									
QC	Memo	0.00				10			
Quality Control									
270	Packaging	0.00							
270									
Packaging	Memo	0.00				1x			SP
Packaging	Identify and pack for shipping as per PPP D412-664-203 *****Ensure tube is not packaged if curing time is less than 12 hrs, see step 27 for application time & date ***** Time & date of packaging: _____ Location: _____								12-7-6

Rev I

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 84098

84098

Page 8

May-02-12 4:17:57 PM

Item ID: D412-664-203

Accept

N900040100

Setup Start *NS1*

Revision ID:

Item Name: Crosstube Aft

Stop *NS2*

Start Date: 02/05/2012 Start Qty: 1.00 *1*

Cust Item ID:

Required Date: 22/05/2012 Req'd Qty: 1.00 *1*

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start *NR1*

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
280	QC21- Final Inspection - Work Order Release	0.00							
280									
QC	Memo	0.00							
Quality Control									

CK 12/7/12

MF
12-07-06

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

May-02-12 4:18:01 PM

Page 1

Work Order ID: 84098

84098

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 02/05/2012

Required Date: 22/05/2012

Start Qty: 1.00

Required Qty: 1.00

Comments:

IPP Rev:E04.02.16Reformat; Added D3189-1K/DS
 IPP Rev:F 06-03-29 Remove Coments on Pick List JLM
 IPP Rev:G 06.12.08 per ECN 886 EC
 IPP Rev:H 07-04-30 As per Rev D JLM
 IPP Rev:I 08-06-12 add comment in seq. 21 DD verified by:EC IPP rev J
 11.04.21 DEO D412-664-243-E-1 EC verified DD IPP REV:K
 11.10.03 DEO D412-664-243-E-2 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D412-664-203TRN *D412-664-203TRN* Crosstube Turning Detail		Manufactured	No			110	Each	2.0000	1	1			
									**			TW	12-6-20
				<u>Location</u>				<u>Loc Qty</u>		<u>Loc Code</u>			
				LG003				2					
				83178				1					
				83179				1					
D2896-1 *D2896-1* Support		Manufactured	No			230	Each	26.0000	1	1			
									**			AB	12-7-5
				<u>Location</u>				<u>Loc Qty</u>		<u>Loc Code</u>			
				LG052				8				①	
				80586				8					
				LG053				18					
				74465				18					
D3189-1 *D3189-1* Chafing Shield		Manufactured	No			230	Each	12.0000	2	2			
									**			AB	12-7-5
				<u>Location</u>				<u>Loc Qty</u>		<u>Loc Code</u>			
				FG				4				②	
				36065				4					
				LG052				8					
				81060				8					

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

May-02-12 4:18:01 PM

Page 2

Work Order ID: 84098

84098

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 02/05/2012

Required Date: 22/05/2012

Start Qty: 1.00

Required Qty: 1.00

D3595-063-570

Manufactured No

230

Each

163.0000

2

2

D3595-063-570

RUBBER CUSHION

**

AL 12-7-5

Location

Loc Qty

Loc Code

FG

8

37971

1

42243

7

LG

78

83294

78

MAT052

77

71534

1

76546

76

(2)

MS21920-28

Purchased

No

230

Each

83.0000

4

4

MS21920-28

Clamp(per MIL-DTL-8783C)

**

AL 12-7-5

Location

Loc Qty

Loc Code

FG

5

105884

5

LG050

58

116839

2

118713

4

120054

2

121067

50

(4)

LG051

20

121440

20

May-02-12 4:18:02 PM

Shop Packet Print

Page 2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

May-02-12 4:18:02 PM

Page 3

Work Order ID: 84098

84098

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 02/05/2012

Required Date: 22/05/2012

Start Qty: 1.00

Required Qty: 1.00

MS21920-30

Purchased

No

230

Each

107.0000

2

2

MS21920-30

clamp(per MIL-DTL-8783C)

**

12-7-5

Location

Loc Qty

Loc Code

LG

44

119529

44

LG051

63

111258

14

121583

49

AN6-40A

Purchased

No

250

Each

114.0000

4

4

AN6-40A

Bolt

**

JB

Location

Loc Qty

Loc Code

ST342

114

120187

66

120833

4

121349

19

121584

25

121584

AN6-41A

Purchased

No

250

Each

55.0000

2

2

AN6-41A

Bolt

**

JB

Location

Loc Qty

Loc Code

ST342

55

119749

5

120423

50

120423

AN960JD616

NAS1149D0663J

Purchased

No

250

Each

0.0000

18

18

AN960JD616

Washer

**

121444 JB 12/07/06

May-02-12 4:18:02 PM

Shop Packet Print

Page 3

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

May-02-12 4:18:02 PM

Page 4

Work Order ID: 84098

84098

Parent Item: D412-664-203

D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 02/05/2012

Required Date: 22/05/2012

Start Qty: 1.00

Required Qty: 1.00

MS21042L6

Purchased

No

250

Each

714.0000

6

6

**

MS21042I 6

Nut

Location

Loc Qty

Loc Code

ST300

714

117677

25

118384

3

118927

48

119075

438

120308

200

119075

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

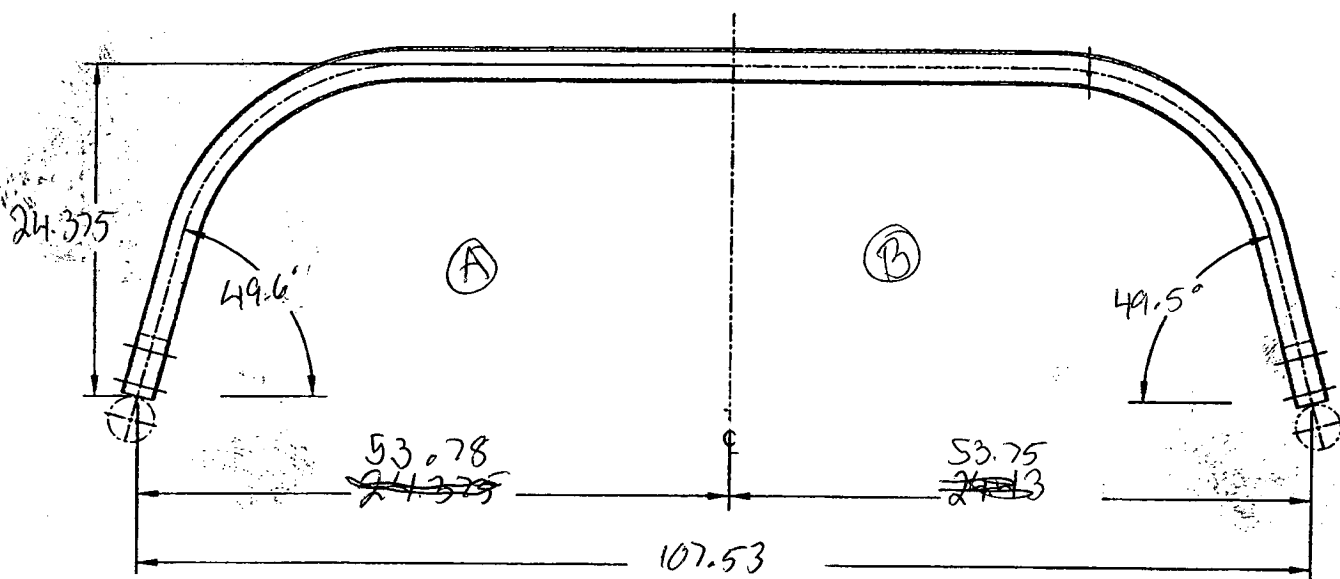
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	84098
Description: Crosstube High Aft (412)		Part Number:	D412-664-203
Inspection Dwg: D412-664-243 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	24.24	24.50
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.70



Crushing	(A) 6.9°/10	Comments
	(B) 7.2°/10	
Passes	(A) 2/24	center 16
	(B) 2/24	(A)

QC15 Inspection	(B) 120625
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.08	Dimensions updated per Dwg rev. D	KJ/JLM	
C	10.02.02	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Item	Qty -243	Part Number	Description
1	X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
2	1	D6009-129	CROSSTUBE
3	2	D3595-063-570	RUBBER CUSHION
4	1	D2896-1	SUPPORT
5	2	D3189-1	CHAFING SHIELD
6	2	D2856-600-1009	ABRASION STRIP
7	4	MS21920-28	CLAMP
8	2	MS21920-30	CLAMP (OR MS21920-32)
9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6009-129
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)
- FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- WEIGHT: 47.0 lbs (PER IIN-D212-664)
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- TORQUE CLAMPS 80 TO 100 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER

NO. 84098 MLC

12/05/02

② DEO ATTACHED

RELEASED
2009-10-29

E	REFORMAT/REVISE GENERAL NOTES; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	09.09.30
D	REMOVE D2732-058, CHANGE TO D3595-063-570	PH	07.03.09
C	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398. MS21920-32 WAS MS21920-30	MB	06.10.27
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	01.10.17
REV.	DESCRIPTION	BY	DATE
DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. E
MFG. APPR.	DS	D412-664-243	SHEET 1 OF 4
APPROVED	140	TITLE	SCALE
DE APPR.	141	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30	COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

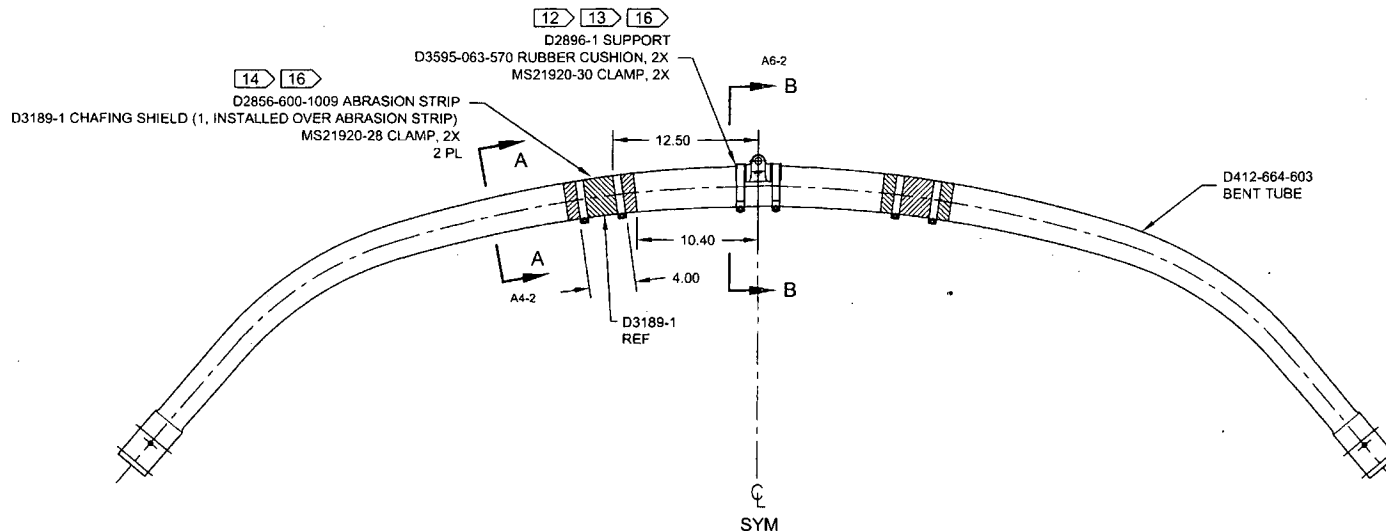
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

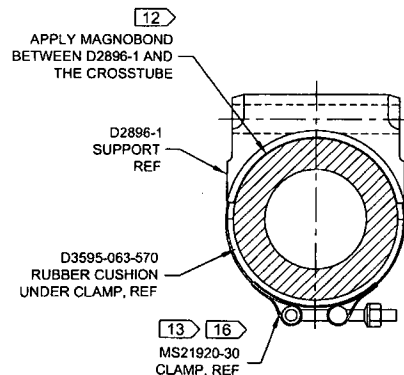
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

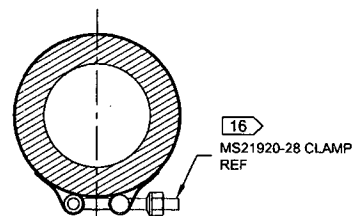
NOTE: Date & initial all entries



D212-664-243
ASSEMBLY DETAIL



SECTION B-B D4-2
SCALE 4X



SECTION A-A C6-2
SCALE 4X

2 DEO ATTACHED

RELEASED
2009-10-28
NAP

DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. E
MFG. APPR.	DS	D412-664-243	SHEET 2 OF 4
APPROVED	HA	TITLE	SCALE
DE APPR.	HA	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30	COPYRIGHT © 2001 BY DART AEROSPACE LTD	
THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.			

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

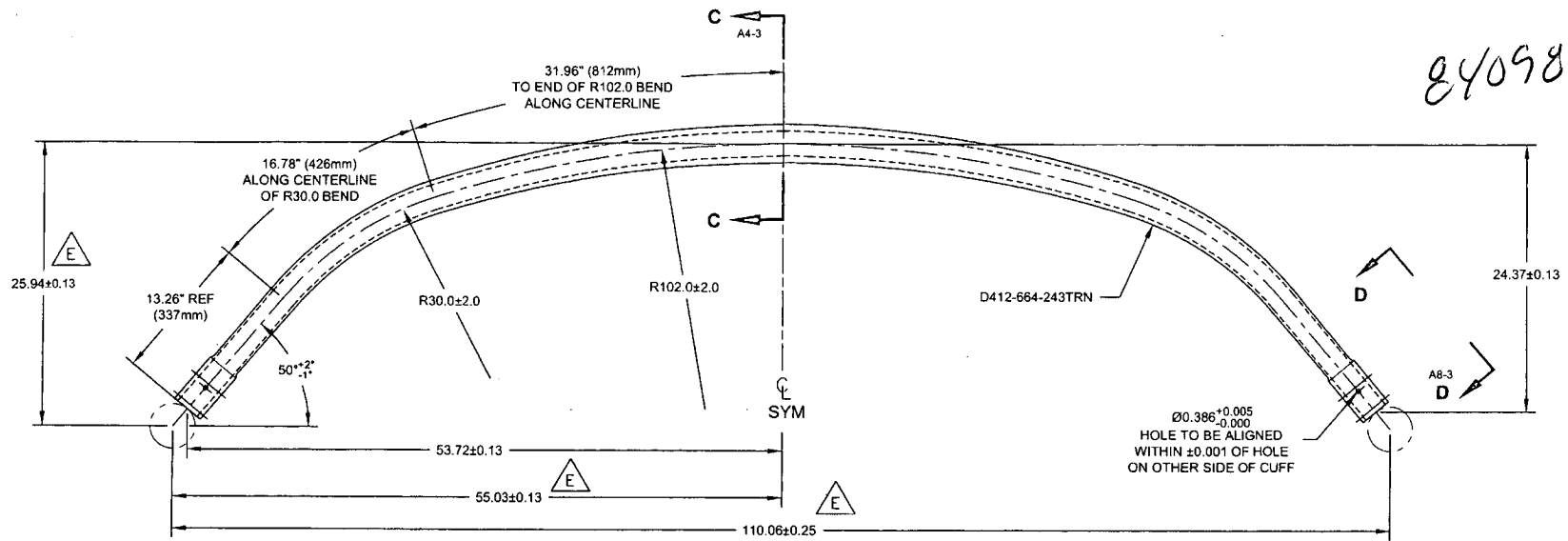
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

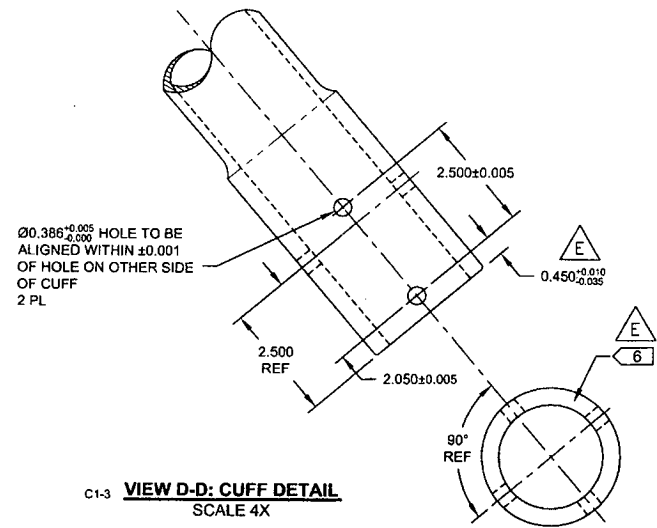
NOTE: Date & initial all entries

8 7 6 5 4 3 2 1

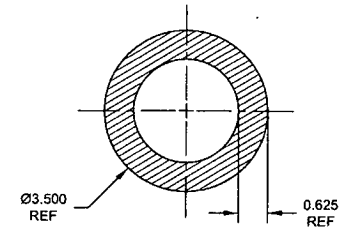
84098



D412-664-603 10 E
BENDING AND DRILLING DETAIL



VIEW D-D: CUFF DETAIL
 SCALE 4X



SECTION C-C D5-3
 SCALE 4X

② DEO ATTACHED

RELEASED

2009-10-29

MP

DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	Q	DRAWING NO.	REV. E
MFG. APPR.	DS	D412-664-243	SHEET 3 OF 4
APPROVED	MP	TITLE	SCALE
DE APPR.	MP	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30	COPYRIGHT © 2001 BY DART AEROSPACE LTD	
THIS DOCUMENT IS UNCLASSIFIED AND CONFIDENTIAL. IT IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.			

8 7 6 5 4 3 2 1

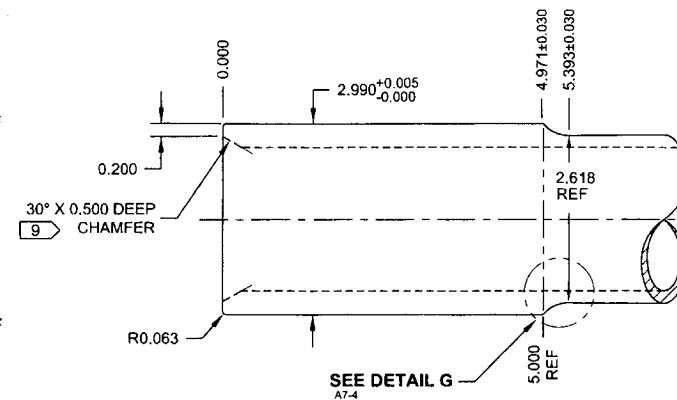
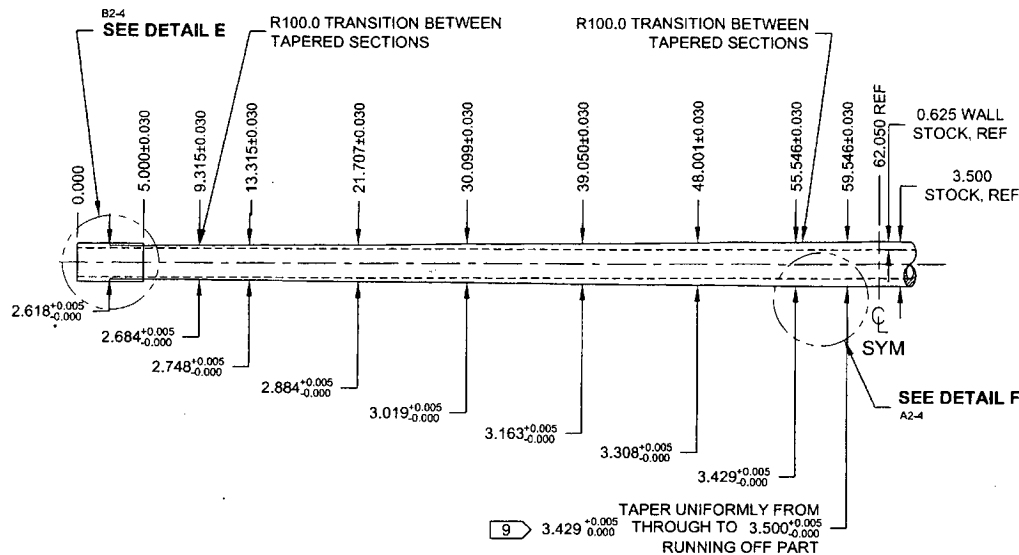
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

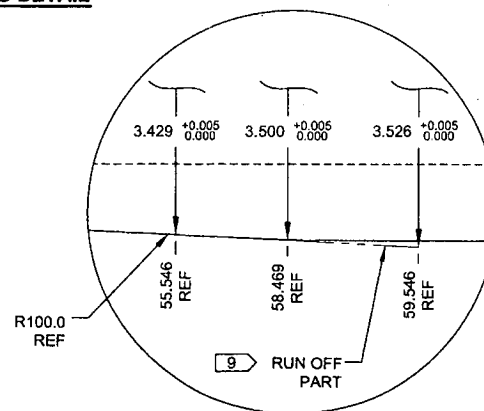
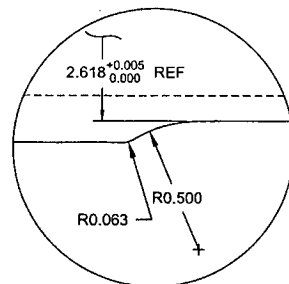
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



D412-664-243TRN

TURNING DETAIL



2 DEO ATTACHED

RELEASED

2009-10-29

DESIGN	PH	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	Q	DRAWING NO.	REV. E
MFG. APPR.	DS	D412-664-243	SHEET 4 OF 4
APPROVED	AP	TITLE	SCALE
DE APPR.	TH	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	09.09.30	COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL. AND IS SUPPLIED ON THE EXPRESS COMMISSION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMODITY OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DRAWING NO. D412-664-243	TITLE CROSSTUBE ASSEMBLY (412 HI AFT)	REV. E	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO. D412-664-243-E-1	SHEET NO. SHEET 2 OF 2	SCALE NTS
DRAWN <i>[Signature]</i>	CHECKED <i>[Signature]</i>	MFG. APPR. <i>[Signature]</i>	APPROVED <i>[Signature]</i>	DE APPR. <i>[Signature]</i>		
DATE 11.03.31	DATE 11.03.31	DATE 11.03.31	DATE 11.03.31	DATE 11.03.31	DATE 11.03.31	

IS:

D3189-1 CHAFING SHIELD (1, INSTALLED OVER PROSEAL 890)
MS21920-28 CLAMP, 2X
2 PL

D412-664-603
BENT TUBE

2.00
1.00

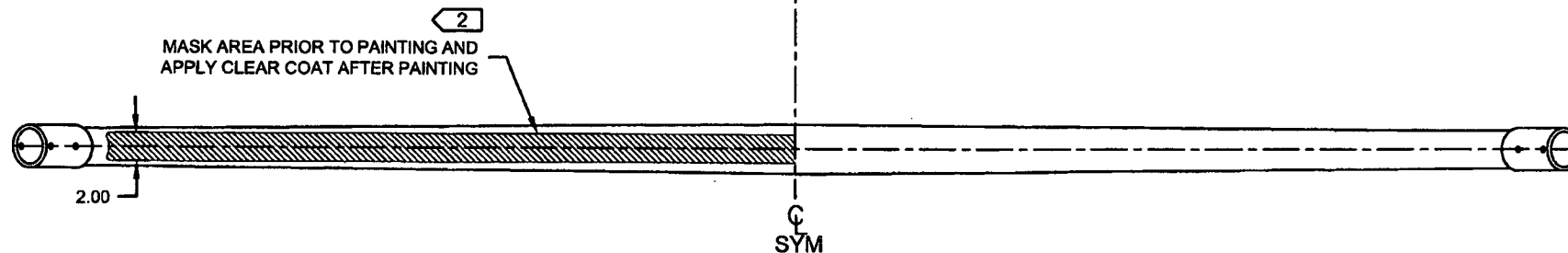
WAS:

D2856-600-1009 ABRASION STRIP
D3189-1 CHAFING SHIELD (1, INSTALLED OVER ABRASION STRIP)
MS21920-28 CLAMP, 2X
2 PL

D3189-1
REF

**D412-664-243
ASSEMBLY DETAIL**

RELEASED
2011-04-07
[Signature]



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DRAWING NO. D412-664-243	TITLE CROSSTUBE ASS'Y (412 HI AFT)	REV. E	DART AEROSPACE LTD ENGINEERING ORDER		D.E.O. NO. D412-664-243-E-2	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>qp</i>	CHECKED <i>ASS</i>	MFG. APPR. <i>ER</i>	APPROVED <i>MP</i>		DE APPR. <i>MP</i>		
DATE 11.09.07	DATE 11.09.19	DATE 11.09.19	DATE 11.09.19		DATE 11.09.19		

PURPOSE:

REPLACE MAGNOBOND WITH 3M DP460 SCOTCH-WELD EPOXY ADHESIVE

24098

CHANGE:

IS:

Item	Qty -243	Part Number	Description
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD

WAS:

9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
---	-----	----------------	---

NOTE 12 & 16, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

- 12) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVE HAS CURED FOR 24 HOURS.

WAS:

- 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RELEASED
2011-09-29
MP

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

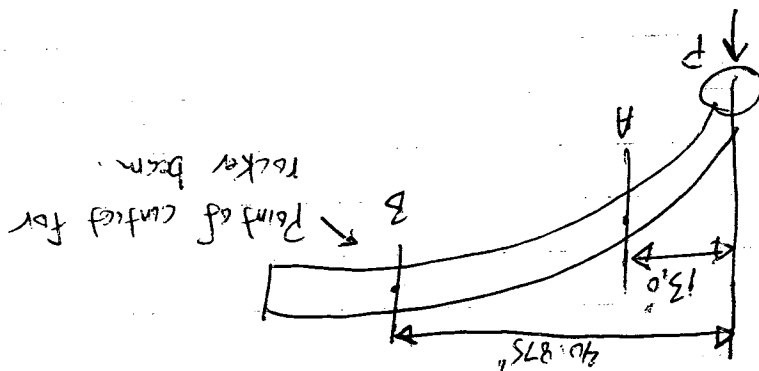
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

11.12.06

CRUSHING OF D412-664-243

Acceptability of 8% CRUSHING AT END OF BEND



Point A: $OD_1 = 2.961$, $OD_2 = 2.522$
 $CRUSHING = (2.961 - 2.522) / (2.961 + 2.522) = 8\%$
 $I = 1.676 \text{ in}^4$ (from AutoCAD)

Point B: $OD_1 = 3.357$, $I = 4.613 \text{ in}^4$

A: $F = M_c / I = P \times 13 \times 2.961 / 2 \times 1.676 = 11484 \cdot P$
 B: $" = P \times 40.875 \times 3.357 / 2 \times 4.613 = 14.651 \cdot P$

M.S. = $14.651 / 11.484 = 1.27$

∴ Tube will break at rocker beam contact before area of 8% crushing, 8% crushing in area at end of tube
 bend is acceptable
 11.12.06



LIQUID PENETRANT TEST REPORT

P- 12191

PAGE 1 OF 1

CLIENT DART AeroSpace DATE JUNE 27/2012 TIME AM ☒ PM ☐
ATTENTION MATT/LINDA ACUREN JOB NO. 188-12-C0274
ADDRESS 1270 ABDELDEEN POWO No. 173/1 -
HAWKESBURY, ON. WORK LOCATION SAME
ACCEPTANCE STD. AS 1417/RSI-038 REV./DATE 2005
PROJECT F.P.I. on CROSS TUBES
ITEM(S) EXAMINED 4 PCS

JOB DESCRIPTION SEE RESULTS PROCEDURE NO. LT 002 REV./DATE 2008 TECHNIQUE NO. LT 002 REV./DATE 2008
PART NO. SEE RESULTS MATERIAL ALUMINUM THICKNESS VARIABLES
SCOPE A. WET FLUORESCENT DYE PENETRANT WAS USED ON 100% OF THE SURFACE ONLY.

TEST DETAILS

METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED
FAMILY BRAND	<u>MADEA FLUX</u>		BLACK LIGHT S/N <u>10439</u>	<input checked="" type="checkbox"/> OUTPUT > 1000 μ W/cm ² <input type="checkbox"/> AMBIENT < 2 fc	
PENETRANT	<u>ZL67</u>	MINIMUM DWELL TIME <u>45</u> MIN.	LIGHTING EQUIP. <input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT	<input type="checkbox"/> OUTPUT > 100 fc @ SURFACE	
PENETRANT REMOVER	<u>H₂O</u>	MINIMUM DRY TIME <u>>10</u> MIN.	OTHER <u>LABINO</u>		
DEVELOPER	<u>SKD 52</u>	MINIMUM DWELL TIME <u>10</u> MIN.	LIGHT METER S/N <u>1098866</u>	CAL DUE DATE <u>JULY 28 2012</u>	
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS	<input type="checkbox"/> AQUEOUS	<input type="checkbox"/> DRY		

TEST SURFACE

SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input checked="" type="checkbox"/> CLEAN BARE METAL
SURFACE TEMPERATURE	<input type="checkbox"/> < -4°C/ 20°F	<input type="checkbox"/> -4°C/ 20°F TO 10°C/ 50°F	<input checked="" type="checkbox"/> 10°C/ 50°F TO 52°C/ 125°F	<input type="checkbox"/> > 52°C/ 125°F	

RESULTS- ☒ METRIC ☐ IMPERIAL

W.O.#	CROSS TUBE	RESULTS
1-82349	" "	✓
1-82350	" "	✓
1-84099	" "	✓
1-84098	" "	✓

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE <u>Matthew Murdoch</u> PRINT	<u>Matthew Murdoch</u> SIGNATURE	DTR # <u>E63664</u>
TECHNICIAN (SIGNATURE): <u>Mike J. Hosh</u>		REPORT REVIEWED BY:
NAME (PRINT): <u>Mike J. Hosh</u>	1 ST TECHNICIAN	NAME INITIALS
CGSB LEVEL <u>II</u> SNT LEVEL	CGSB LEVEL SNT LEVEL	
CGSB REG. No	CGSB REG. No	